

Data analysis for Miltos Balidis, et al., "Validation of Neural Network Predictions for the Outcome of Refractive Surgery for Myopia", 2020

– software in Matlab

Introduction: Refractive surgery (RS) for myopia has made very big progress in terms of safety and predictability of the outcome. Still, a small percentage of operations require retreatment. It is, therefore, both legally and ethically desirable that patients are advised, beforehand, of how probable it is that corrective RS may be required. We addressed this issue by exploring the use of Neural Networks (NN) in RS for myopia.

Methods: We anonymously searched the Ophthalmica Institute of Ophthalmology and Microsurgery database for patients who underwent RS with PRK, LASEK, Epi-LASIK or LASIK between 2010 and 2018. We used a total of 13 factors related to RS. The data were normalized by forcing the weights used in the forward and backward propagations to be binary; each integer was represented by a 12-bit serial code, so that following this preprocessing stage, the vector of the data values of all 13 parameters was encoded in a binary vector of $1 \times (13 \times 12) = 1 \times 156$ size.

Preprocessing Stage

These data preprocessing are implemented via the following files:

Correct.xls (this file contains the data of the non-retreat group)

Retreat.xls (this file contains the data of the retreat group)

Preprocess.m (this file contains the data of binary 12-bit vectors)

Normcor.m (this file contains the data of binary vector $1 \times (13 \times 12) = 1 \times 156$ size)

Learning Stage

Following the preprocessing stage, eight independent Learning Vector Quantization (LVQ) networks were created in random way using the function Ivqnet of Matlab, each one of them responding to one query with (0 retreat class) or (1 correct class).

These are implemented via (nets1-8 m) and train.m files

Testing Stage

The results of the eight LVQs were then averaged to permit a best estimate of the network's performance while a voting procedure by the neural nets was used to arrive at the outcome

These are implemented via test.m and testtotal.m files

References

Balidis, Miltos, et al. "Using neural networks to predict the outcome of refractive surgery for myopia." *4open* (2019).